PATENT SPECIFICATION

Application Date: March 13, 1928. No. 7729/28. **312,720**

Complete Left: Dec. 12, 1928.

Complete Accepted: June 6, 1929.

PROVISIONAL SPECIFICATION.

Improvements in or relating to Electrically Propelled Locomotives and Trains.

We, GEORGE ROBERT HIGGS, of 7, Inverary Terrace, Dundee, in the County of Forfar, Scotland, a subject of the King of Great Britain, and METROPOLITAN-VICKERS ELECTRICAL COMPANY LIMITED, of 4, Central Buildings, in the City of Westminster, a British Company, do hereby declare the nature of this invention to be as follows:—

This invention relates to current collectors such as trolleys or more usually pantographs carried on electric trains or locomotives and adapted to be raised or lowered into engagement with an overhead supply conductor.

It is usual, particularly when such trolley poles or pantographs, hereinafter for simplicity referred to only as pantographs, are employed on high voltage systems to provide a disconnecting switch and an earthing switch which latter is preferably interlocked with the door of the high tension compartment of the locomotive. One arrangement of this kind is set forth in the specification of Letters Patent No. 234,571, and a modified arrangement forms the subject of application No. 407 filed on the 5th day of January 1928 (Serial No. 308,002), pursuant to a Patent of Addition. It is also common practice to employ duplicate pantographs either of which can be alternatively used, this being desirable in case a fault occurs on one pantograph and its immediately associated circuit, or it becomes damaged.

According to the present invention, when two alternatively usable pantographs are required to supply one or other or both of two motive equipments in a locomotive or train each pantograph is provided with two disconnecting switches arranged in series with one another and the common points of each pair of switches are adapted to be connected together through a removable link or switch which in turn is adapted to be bridged by a double-pole single-throw switch or the equivalent by which the entire pantograph system can be earthed. By such arrangement at least one motive equipment can be fed from at least one pantograph under conditions of any single fault on a pantograph or motive equipment.

Preferably the high tension chamber is divided into two compartments, or two high tension chambers are employed into which compartments or chambers the pantograph leads pass at comparatively widely separated points to the disconnecting switches, whilst also the leads to the respective motive power equipments pass out from disconnecting switches at widely separated points. Preferably the earthing switch is interlocked with a single entrance door to the two compartments or chambers or with the entrance door to each chamber, or alternatively two separate earthing switches may be provided each interlocked with the respective entrance door to the two compartments or chambers.

In carrying out the invention according to a convenient arrangement the two high tension compartments or chambers are connected by a passage and the arrangement is such that one compartment or chamber can only be reached by the entrance door of the other compartment or chamber and by the passage. A connecting conductor in which the removable link can be included passes from one compartment or chamber to the other.

The earthing switch or switches is or are preferably located near the entrance door or respective doors and arranged for operation by a handle which passes to the outside of the compartment or chamber.

The invention is notably applicable to the duplex traction system set forth in the specification of application No. 7424 filed on the 9th day of March, 1928, but has a wider application.

Dated the 12th day of March, 1928.

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Agent for the Applicants.

[*Price* 1/-]

COMPLETE SPECIFICATION.

Improvements in or relating to Electrically Propelled Locomotives and Trains.

We, GEORGE ROBERT HIGGS, of 7, Inverary Terrace, Dundee, in the County of Forfar, Scotland, a subject of the King of Great Britain, and ASSOCIATED ELECTRICAL INDUSTRIES LIMITED, of Bush House, Aldwych, in the City of Westminster, formerly known as Metropolitan-Vickers Electrical Company Limited, of 4, Central Buildings, in the City of Westminster, a British Company, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to switching arrangements associated with current collectors such as trolleys or more usually pantographs carried on electric trains or locomotives and adapted to be raised or lowered into engagement with overhead supply conductors.

In the interests of safety to workmen inspecting, adjusting or repairing the equipment, it is usual particularly when such trolley poles or pantographs, hereinafter for simplicity referred to only as pantographs, are employed on high voltage systems, to provide a disconnecting switch and an earthing switch which later is preferably interlocked with the door of the high tension compartment of the locomotive. One arrangement of this kind is set forth in the specification of Letters Patent No. 234,571, and a modified arrangement is set forth in the specification of Letters Patent No. 308,002 which is a Patent of Addition thereto. It is also common practice to employ duplicate pantographs which can be alternatively used, this being desirable in case a fault occurs on one pantograph and its immediately associated circuit, or it becomes damaged.

According to the present invention, when two alternatively usable pantographs are required to supply one or other or both of two motive equipments in a locomotive or train each pantograph is provided with two disconnecting switches arranged in series with one another and the common points of each pair of switches are adapted to be connected together through a removable link or switch which in turn is adapted to be bridged by one or more switches, for instance a double-pole single-throw switch by which the entire pantograph system can be earthed. By such arrangement at least one motive equipment can be fed from at least one pantograph under conditions of any single fault on a pantograph or motive equipment.

To enable the invention to be clearly understood it will now be described with reference to the accompanying drawings, the single figure of which is an electrical diagram showing the pantograph switching system applied by way of illustration to an elementary traction system comprising two motors arranged for series-parallel control.

In the drawing T and G represent supply conductors, trolley and ground, 1 and 2 represent the armatures of the two motors, F1 and F2 the respective field windings, and R1 and R2 the usual series resistance for rheostatic speed control whilst LS1 and LS2 are line switches and E and S are switches for obtaining series-parallel control in the well-known manner.

The pantograph collectors are indicated by P1 and P2 and the switching system according to the invention is indicated by the reference letters *a* to *f* inclusive. It will be seen that for each pantograph there are two switches in series with one another, namely *a* and *d* for pantograph P1 and *c* and *e* for pantograph P2. The common points of the two pairs of switches are adapted to be connected together by a removable link or switch indicated at *b* and are adapted to be earthed by the double pole single throw switch *f*.

With the arrangement above described it will be appreciated that when both motors are in service the pantograph P1 can be used by closing switches *a*, *d* and *e*, the link *b* being left in position and the switch *c* left open, or the pantograph P2 can be used by closing switches *c*, *e* and *d* and still leaving the link *b* in position but opening the switch *a*.

If a fault develops on one of the motors or its control circuit current can still be applied to the other motor from either pantograph. Thus if say motor No. 1 and pantograph P1 are out of service, the link *b* can be removed and motor No. 2 supplied from pantograph P2, the switches *c* and *e* being closed. On the other hand if say motor No. 1 and pantograph P2 are out of service, motor No. 2 can be supplied from pantograph P1 by closing switches

a and *e*, by opening switches *d* and *c* and leaving the link *b* in position. When workmen are in the high-tension chamber or on the roof of the locomotive the pantographs must have been lowered and the switch *f* closed. It will be understood that the invention may be applied to other and more elaborate motive equipments. For instance there may be more than two motors and field weakening and regenerative braking may be employed. The invention is notably applicable to the duplex traction system set forth in the specification of application No. 7424 filed on the 9th day of March, 1928, but has a wider application.

Preferably the high tension chamber in which the switches *a* to *f* are located is divided into two compartments, or two high tension chambers are employed into which compartments or chambers the pantograph leads may pass at comparatively widely separated points to the disconnecting switches, whilst also the leads to the respective motive power equipments pass out from disconnecting switches, at widely separated points. Preferably the earthing switch is interlocked with a single entrance door to the two compartments or chambers or with the entrance door to each chamber, or alternatively two separate earthing switches may be provided each interlocked with the respective entrance door to one of the two compartments or chambers.

Conveniently the two high tension compartments or chambers are connected by a passage and the arrangement is such that one compartment or chamber can only be reached by the entrance door of the other compartment or chamber and by the passage. A connecting conductor in which the removable link *b* can be included passes from one compartment or chamber to the other. The earthing switch or switches *f* is or are preferably located near the entrance door or respective doors and arranged for operation by a handle which passes to the outside of the compartment or chamber. The arrangement is advantageous in providing complete safety to workmen and in permitting the cutting out in a simple manner of a defective portion of a duplex equipment. For a fuller description of the arrangement of compartments attention is directed to the Specification of Application No. 8649, filed on the 21st day of March, 1928. The arrangement of compartments only forms part of the present invention when in combination with the two main features hereinafter claimed.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. For an electric locomotive or train having alternatively usable current collectors, and two motive equipments, a switching arrangement in which each collector is provided with a pair of disconnecting switches arranged in series with one another and the common points of each such pair are adapted to be connected together through a removable link or switch and to be earthed by one or more other switches, for the purpose specified.

2. A switching arrangement as claimed in claim 1 having the pairs of disconnecting switches disposed in two high tension compartments or chambers of a locomotive or train the door or doors of which compartments or chambers is or are interlocked with the earthing switch or switches, substantially as described.

3. A switching arrangement as claimed in claim 2, in which the two high tension compartments or chambers are connected by a passage and arranged such that one compartment or chamber can only be reached by the entrance door to the other and by the passage, substantially as described.

4. In or for electric traction systems, current collector switching arrangements substantially as described with reference to the accompanying drawing.

Dated the 12th day of December, 1928.

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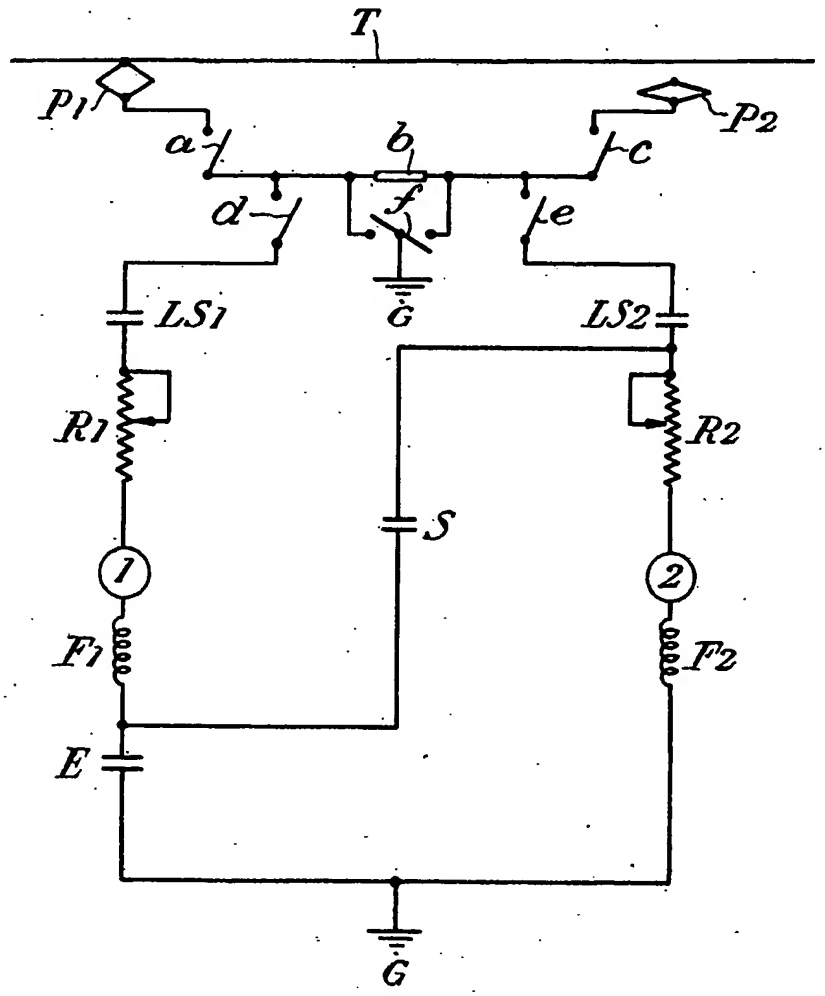
Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1929.

312,720 COMPLETE SPECIFICATION 1 SHEET



[This Drawing is a full-size reproduction of the Orginal]

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